

DMA 5000

Density | Specific Gravity |
Concentration Meter

::: Unique Density & Concentration Meters



It started in 1967...

The determination of density is a well-established tool for product monitoring and quality control. Knowledge of the density is required for many complex applications, including research and development projects. Several methods can be used to measure the density of a liquid. The pycnometer and the hydrometer are traditional instruments for density determination, to name a few.

The demand for an instrument that provides increased precision as well as fast results led to the development of the DMA 5000 density meter. This development contributed to the growth of the company Anton Paar. In 1967, the company had 35 employees. Today, there are more than 500 people employed worldwide.

Key factors in our success

- ▶ Highly motivated employees working on their own initiative
- ▶ More than 20% of the yearly turnover invested in R&D
- ▶ Long-term investment in and cultivation of key technologies
- ▶ An international sales and service network
- ▶ Efficient and respectful use of both natural and human resources
- ▶ A flat decision-making structure consisting of responsible teams
- ▶ A charitable foundation as the owner
- ▶ Thorough and continuous training of employees and apprentices

The first digital density meter ever, the DMA 02C, was introduced in 1967. The measuring principle of the DMA 02C was based on the U-tube method which revolutionized density determination as it allowed fast and reliable results with much better repeatability- in less time in a very convenient way!

Soon this method, developed by H. Stabinger and H. Leopold, was established worldwide and became the acclaimed standard method for density determination.

Over the years, this technology was further improved. The result is the DMA 5000.

The best we have.

The best on the market.



1967
DMA 02C



1970
DMA 10



1975
DMA 55



1987
DMA 58



today
DMA 5000

DMA 5000 | Best Quality for Best Results

The most accurate high-precision density meter on the market

Patented reference oscillator built into the measuring cell for improved performance

- ▶ Eliminates long-term drift
- ▶ One adjustment at 20 °C is sufficient for the whole measuring range
- ▶ Automatic scan of density and temperature can be performed easily
- ▶ Four different equilibrium modes ensure optimum results

In-cell temperature measurement by high-precision platinum thermometer

- ▶ The high-precision platinum thermometer is the most accurate temperature sensor available
- ▶ Traceable to international standards
- ▶ Adjustable and calibratable

Automatic viscosity correction simplifies measurements

The viscosity of a sample affects the density determination. The DMA 5000 automatically corrects the viscosity influence on density over the whole viscosity range. Whether your samples have high or low viscosity, the DMA 5000 determines the density quickly and correctly!

Viscosity correction over the full range

- ▶ Viscosity-related errors inherent to all types of oscillating U-tube density meters are automatically eliminated
- ▶ Viscosity correction covers all sample viscosities
- ▶ No need for viscous standards such as sucrose standards
- ▶ Simultaneous display of viscosity-compensated and non-compensated results allows direct comparison with results from older instruments

**Competent.
Excellent.
Diligent.**





The Determination: Fast, Accurate and Easy to Perform

Fast and precise measuring results as well as high accuracy and precision are the trademark of Anton Paar density meters. The DMA 5000 density meter combines the well-known Anton Paar U-tube measuring principle with the patented reference oscillator and a high-precision Platinum thermometer.

The resulting instrument is a density meter that provides an accuracy of $5 \cdot 10^{-6} \text{ g/cm}^3$ and a repeatability of $1 \cdot 10^{-6} \text{ g/cm}^3$ – specifications which were previously unheard of.

To illustrate this high repeatability, let us express the impressive number of $1 \cdot 10^{-6}$ in terms of time:

The $1 \cdot 10^{-6}$ th part of a year would be half a minute!!

And that's how a measurement is performed

Just introduce your sample into the U-tube and hit the start button. After less than one minute, an acoustic signal informs you that the measurement is finished.

That means that all you need to get excellent results out of your DMA 5000 is a carefully degassed sample and a syringe or sample handler.

It is that simple.

The measuring principle

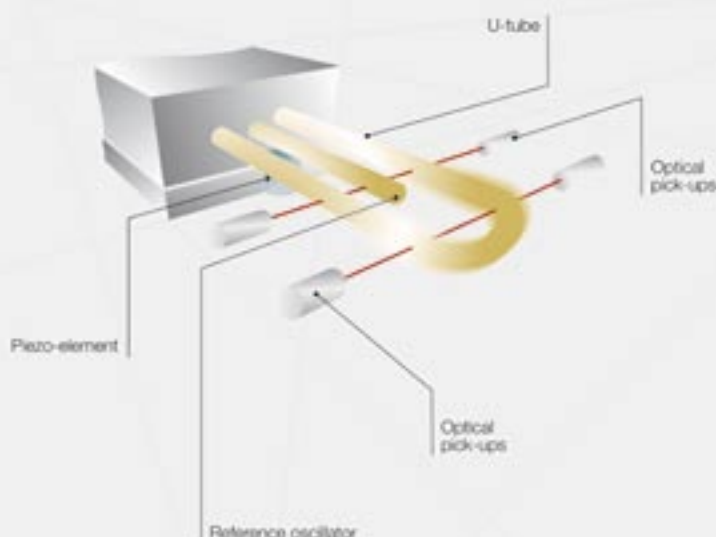
A U-shaped glass tube of known volume and mass is filled with the liquid sample and excited electronically by a Piezo element. The U-tube is kept oscillating continuously at the characteristic frequency f . Optical pick-ups record the oscillation period P as $P = 1/f$.

This frequency is inversely proportional to the density ρ of the filled-in sample. The reference oscillator speeds up the measurements when aiming at various measuring temperatures.

$$\rho = A \times P^2 - B$$

ρ = DENSITY P = PERIOD A, B = COEFFICIENTS

Once the instrument has been adjusted with air and water, the density of a sample can be determined. Hence, related parameters, e.g. concentration, are calculated from the density.



Convenience at your Fingertips

The powerful software allows you to select and modify up to 10 user methods for different measurement settings and store the newly created method under a specific name.

Sample identification can be performed alphanumerically either by using the keys on the instrument or by connecting a PC keyboard and/or bar code reader for more comfortable operation. When the measurement is completed, the results are automatically displayed and stored in the internal memory for later processing, and there is an optional printer in case you need hard copies of your data.



Time-saving and economic

- ▶ Samples measured in less than 1 minute
- ▶ Typical sample throughput of 10 to 30 per hour
- ▶ Speeds up product OK/Not OK decisions

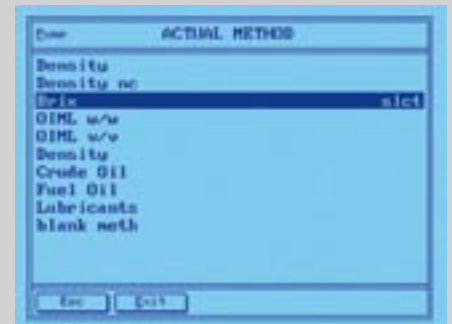
The LCD display is attractive, adaptable and easy to read

There is a choice of concentration units for displaying your results on the screen. You are free to define what is calculated, displayed or printed by selecting the options. If you like, you can display the results that are most important to you in a larger font.

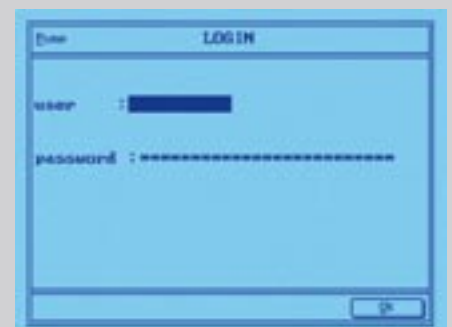
Up to 10 lines of data can be displayed simultaneously, such as density, temperature, specific gravity, % concentration, and many more.

Built-in data handling

- ▶ Many tables, such as °Brix, alcohol, API gravity, are permanently stored in the memory
- ▶ Three blank spreadsheets are pre-programmed so you can enter and modify additional tables without the need of new chips or software
- ▶ Polynomials and a user formula are at your disposal
- ▶ Memory for up to 100 measurements
- ▶ Optional backup card for storage and transfer of instrument configuration



Select one of the 10 preset methods



Prompting the user name and password, if the audit trail function is activated

Safety is our Concern

The DMA 5000 is specifically designed to keep working effortlessly when other instruments fail. Sophisticated filters protect the electronics from spikes and surges while the power supply allows the instrument to operate anywhere in the range of AC 85 to 260 V.

The DMA 5000 density meter is capable of handling even the harshest samples, such as concentrated sulfuric acid, as critical parts are protected from rough environments by the spill-proof components. The built-in air pump for drying the measuring cell provides diligently clean and dry cell conditions prior to injection of a new sample.

If desired, your methods can be password protected and available to selected operators only. The built-in limit alarm will warn you if tolerances of expected measurement results are exceeded.



Density check function to control the validity of adjustments

A screenshot of the AP-SoftPrint software interface, showing a table of measurement data. The table has columns for 'Date', 'Time', 'Method', 'Sample', 'Actual Temp.', 'Density', 'Brix', and 'Condition'. The data is organized into a grid with multiple rows of measurements.

AP-SoftPrint screen shot: Data of a temperature scan

Electronically safe design

- ▶ Unaffected by electromagnetic interference
- ▶ Does not create any EMI
- ▶ Sophisticated filters provide electrical surge and spike protection
- ▶ CE certified

Spill-proof housing and front panel

- ▶ Spilled samples cannot reach the critical electronics inside
- ▶ Keys unaffected by spills

Your data are safe with a DMA 5000

- ▶ Audit trail function for electronic logging and tamper-proof storing of all operating steps
- ▶ As required by ISO, the adjustment history is automatically stored in the instrument
- ▶ Up to 25 adjustment data can be displayed so that built-up coatings or abrasions can be detected

Download your data processing software free of charge!

AP-SoftPrint is a Microsoft Excel Add-In for reading out measuring values and status messages from Anton Paar laboratory density/concentration meters. With Microsoft Excel and AP-SoftPrint the measuring data can be electronically stored thus replacing the optional printer.

The program is available to users of Anton Paar laboratory density and concentration meters. It is license-free and free of charge.

Application Examples

The wide range of applications not only includes research purposes, government and standardization organizations, institutions with the need for highly accurate results, but is also well received with people who have always wanted to operate the most accurate density meter on the market.

Beverage industry

- ▶ Density determination in breweries
- ▶ Determination of alcohol in binary mixtures
- ▶ Extract determination
- ▶ Determination of sugar content in soft drinks and fruit juices
- ▶ Quality control of beverages
- ▶ In combination with an Anton Paar Alcolyzer, determination of alcohol in wine and beer as well as extract and original extract content in beer

Pharmaceutical industry and medical science

- ▶ Determination of specific gravities of medical preparations
- ▶ Quality control of infusion solutions
- ▶ Effects of drugs on body fluids
- ▶ Determination of haematocrit content in blood
- ▶ Urine diagnosis

Petroleum

- ▶ Determination of API gravities
- ▶ Quality control of fuels and additives

Research institutions and government agencies

- ▶ Accurate density measurements over the specified density, temperature and viscosity range
- ▶ Determination of partial specific volume
- ▶ Density gradient in ultracentrifugation
- ▶ Evaluation of density reference liquids
- ▶ Alcohol determination for tax purposes

Chemical and nuclear industry

- ▶ Concentration determination of all acids, bases and other solutions
- ▶ Research on polymer solutions
- ▶ Dilution series
- ▶ Photo/film manufacture
- ▶ Concentration of radioactive substances
- ▶ Determination of the D_2O concentration in H_2O

...food processing industry, cosmetics, environmental analysis, and many more



Combined Forces

Combination of the DMA 5000 with a sample handling unit or sample changer, depending on the amount and consistency of samples, allows easy operation and automated filling of between one and 60 samples.

The combination of a DMA 5000 and Anton Paar Alcolyzer allows the fast and simultaneous determination of density and other parameters such as alcohol content, pH and color.

The simultaneous determination of density and refractive index of your sample can be performed by combining the DMA 5000 with an RXA 156 or RXA 170 refractometer.

Automation allows you to devote your attention to other tasks

SH-1 Sample handling unit

Semiautomatic filling of low viscosity beverages and aqueous solutions of up to 100 mPa.s

SH-3 Sample handling unit

Semiautomatic filling, cleaning and drying of low to medium viscosity samples of up to 500 mPa.s

SP-1m Sample changer

Automatic filling of samples with a viscosity up to 100 mPa.s, three different stacks for 24, 30 or 60 samples

SP-3m Sample changer

Automatic filling, cleaning and drying of samples with a viscosity up to 1000 mPa.s; three different stacks for 24, 30 or 60 samples; with an optional heating attachment for samples with viscosities up to 30,000 mPa.s

Accessories

Bar code reader

Can be connected with or without an optional keyboard

Keyboard

Allows comfortable data entry and menu operation

Printer

For documentation of your current or saved results on a hard copy



Specifications

DMA 5000



Measuring range	0 to 3 g/cm ³
Accuracy	Density: ± 0.000005 g/cm ³ Temperature: ± 0.01 °C
Repeatability, s.d.	Density: 0.000001 g/cm ³ Temperature: 0.001 °C
Measuring temperature	0 to +90 °C (32 to 194 °F)
Pressure range	0 to 10 bar (0 to 145 psi)
Minimum amount of sample	Approx. 1 mL
Materials in contact with the sample	PTFE, borosilicate glass
Typical measuring time per sample	Less than 1 minute
Sample throughput	10 to 30/hour
Dimensions (L x W x H)	440 x 315 x 220 mm (17.3 x 12.4 x 8.7 inches)
Weight	Approx. 21 kg (46 lbs)
Power supply	AC 85 to 260 V; 48 to 62 Hz
Power consumption	50 VA
Interfaces	2x RS 232 for printer/PC/IBM-compatible keyboard/bar code reader
Liquid standards	For traceable density standards please contact your local Anton Paar representative
Equilibrium modes	Predetermined Equilibrium fast Equilibrium medium Equilibrium slow
Special features	Adjustment at high viscosity Temperature scan



Anton Paar – a Partner to Rely on

Our product support is always close at hand

Our worldwide distribution network ensures that Anton Paar is always close by. We are happy to assist you whenever necessary. Customer support for special application requests are a matter of course as finding solutions to your particular problems is our concern.

Make the skills of our staff your advantage!

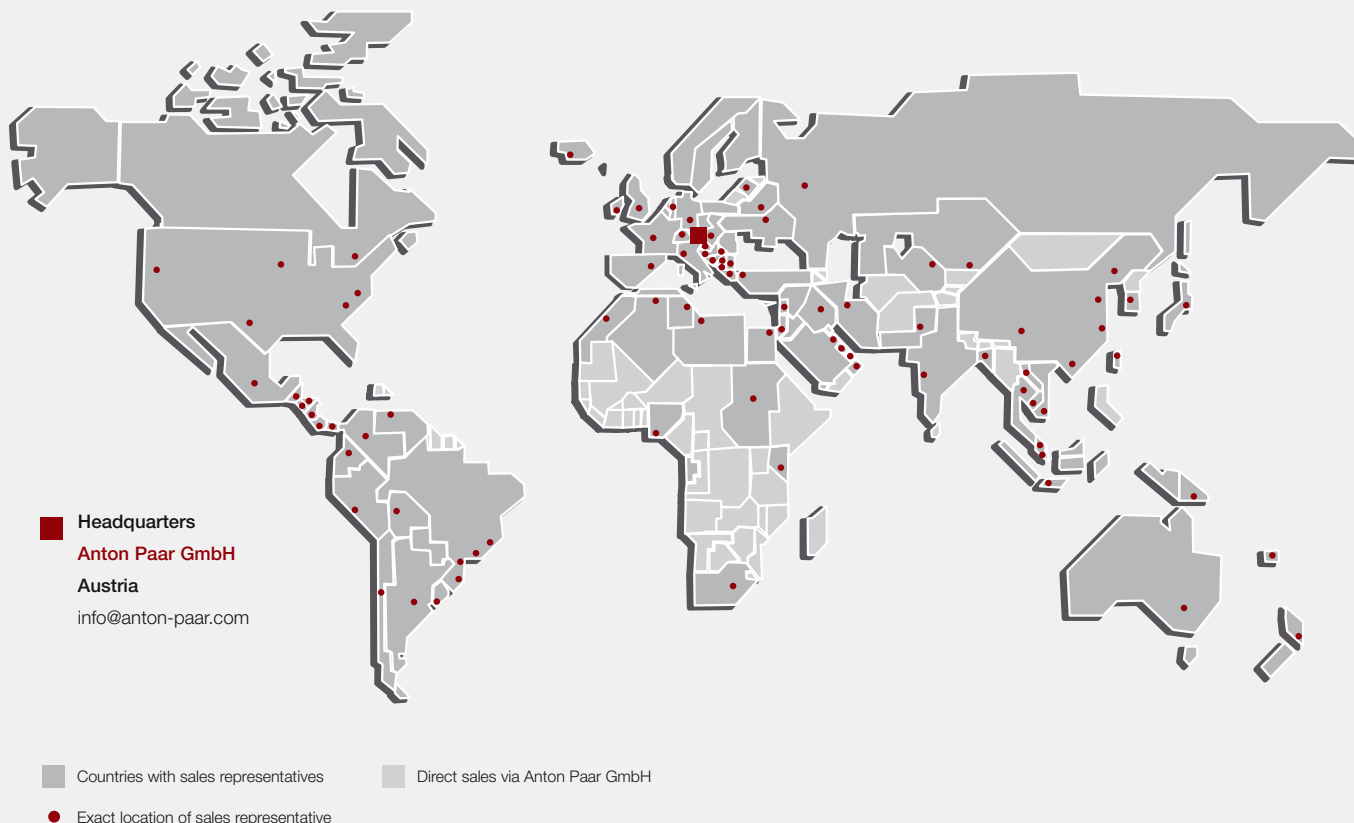
Our extensive in-house training by experienced staff transfers thorough skills to our service and support personnel – our support comprises not only technical and functional details, but also the latest developments on the market for your benefit.

Technical inquiries?

To save you time and money, we have a team of service technicians to assist you – place a phone call and get instant support from our specialists!

**Immediate assistance.
No unnecessary expenses.
Just full support.**

Our international sales network





Pictures: Croce & Wir



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Instruments for:

Density and concentration
 measurement

Rheometry and viscometry

Sample preparation

Colloid science

Microhardness testing

X-ray structure analysis

CO₂ measurement

High-precision temperature
 measurement

Specifications
 subject to change
 without notice.

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